

Mega-Life, Mega-Death, and the invisible hand of the Sun: Towards a quasi-predictive model for the rise and fall of civilisations

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10 minute presentation to Rebecca Bradley's class on the "Collapse of civilisations" Uof Calgary

(fun and speculation, with a sprinkle of blasphemy, very incomplete)

<http://www.billhowell.ca/Climate and sun/Howell - Mega-Life, Mega-Death and the Sun II, towards a quasi-predictive model of the rise and fall of civilisations.pdf>

<http://www.billhowell.ca/Climate and sun/Howell - Solar insolation for civilisations.pdf>

1. Introduction

This is an overview of a conceptual model that my father and I are developing to compliment existing theories for the rise and fall of civilisations, including:

- Mega-Life - new societies & languages, population and wealth explosions, evolution of higher-level personal aspirations, arts, sciences
- Mega-Death - collapses, population decimation, 7 horsemen (floods, drought, pestilence (plagues, locust swarms, crop diseases, etc etc), famine, earthquakes, and the societal restructuring/renewal that goes with catastrophes)

The hypothesis is that astronomy, geology, and evolutionary biology have a far greater role in the fortunes of civilisations than currently recognized, even though that was probably crystal clear to the first civilisations. And while their effects may have been attenuated since the time that they were among the greatest challenges of early civilisations, they are far from being insignificant. As an example, keep in mind that our sun is an especially stable (perhaps relatively boring) main series star, and should one day it behave even momentarily like some of its relatives are occasionally wont to do from time to time, we shall disappear in an instant!

There is absolutely nothing new in a general sense in our hypothesis - most of the core concepts probably all date back at least 5,000 years, albeit not in the same context nor with the same scientific sophistication available today. In a sense, our hypothesis is merely a call to re-incorporate knowledge that the ancients understood so very well, but which we seem unable to grasp in spite of our education and vast army of sages. (That's a completely different hypothesis in the making: Note 1.)

Recent information and concepts come from scientists who continue to throw light on the subject:

- Laskar et al, Paris Observatory - solar insolation programs on hte web
- Sami Solanki, ?Max Plank Institute?, Germany - Holocene period sunspots based on 10Be and 14C
- Ken Tapping, Nat'l Research Council of Canada, Penticton
 - sunspots -> F10.7 -> total irradiance relations
 - TMS theory of solar phase correlation with global influenza pandemics since 1700
- ?? Shaviv & Jan Veizer - Israel & OttawaU - galactic rays and climate over the Phanerozoic era (the last 570 My)
- Paul Charbonneau, Uof Montreal - solar modeling, and a univariate chaotic model
- ?? Absudamov, Russia and David Hathaway, NASA - solar minimum coming?

For some reason, most of us focus on the downside of everything, but this is clearly a skewed and incorrect view of history. The much bigger story is the upside - the cumulative effects of triumphs and progress. The future belongs to those who cast aside the imprisoned thinking of the polyannas, and who decide to cast aside their constraints and customs, and who seize the opportunities that life and times present (and of course - only some of these people - notably the ones who guess right and who

lead and implement effectively). This theme is from the historian Arnold J. Toynbee.

This presentation will only cover three components of our hypothesis - there's only so much that you can say in 10 minutes! Also - we've only just started, and most components of the hypothesis have only just been touched on.

2. Astronomy and the Rise of Reason

The predictable side of astronomy probably had a great deal to do with the rise of logic and science early in civilisation, along with military and civil engineering applications. The ability to model and predict the complex movements of the planets and eclipses was based on quite sophisticated efforts very early in history. No wonder that this near-absolute predictability must have seemed super-natural to early societies, as so much of the rest of their lives was unpredictable and tumultuous.

As shown in Figure 1 (solar system wandering in the galaxy and Galactic rays, explaining the major temperature swings over the last 570 My (Million Years), or Phanerozoic era, likely due to effects on cloud cover) and Figures 2 & 3 (Milankovic cycles and glaciation over the last ~3/4 My), and as explained in Appendix 2, astronomy, geology, and perhaps even evolutionary biology are the major climate drivers. CO₂ doesn't even seem to register at any time scale other than perhaps as one of many possible explanations for anomalously high temperatures in the last 20 years, a period that overlaps the highest 50 years of solar irradiance in the last 8,000 years!.

The glaciations over the last 1 million years seem to relate best to eccentricity, more than the total insolation (Figure 4), whereas from 1 to 3 My ago, it was apparently the precession signal that related best. It isn't known why.

However, as shown later in Figure 8b (Annual average solar insolation over the scale of the eleven plus thousand years of the post-glaciation Holocene period that encompasses all civilizations, but shown for the Mayan latitude) over periods of several hundred years, the regular, predictable effects of the astronomy on climate change in a slight and continuous manner that is swamped by turbulent short-term climate changes and shocks. Perhaps for that reason, the importance of the regular, predictable astronomical changes for civilizations are extremely under-appreciated even by modern scientists.

Figure 5 shows the relatively large changes in solar insolation that occur for certain months of the year. So even if the total annual insolation is relatively constant, its distribution between the seasons can change dramatically.

So when it comes to explaining the rise and fall of your own civilisation, the nice, regular changes due to Milankovic cycles will be "invisible". But one of today's themes is that the Milankovic forcings are very large and important for the fate of civilisations, and we'll later present a concept that puts the overall geographical shifts of the centers of civilisation into perspective.

3. The Treason of the Sun, and the Treason of Man

There is an "unpredictable" side to solar variability over short-term timescales of seconds to thousands

of years. As shown in Figure 6, the most obvious and well-known are the sunspot cycles (Hale half cycle of 8 to 14 years - average 11 years, Swartz ~22 year full cycle), during which the magnetic pole of the sun flips. Notice the beautiful "butterfly-like" pattern for the sunspot occurrences when plotted by latitude and time. This was discovered by the British scientist Maunder in the 19th century, and I'll draw a metaphor from this effect later on.

A second well-known "unpredictable" component of short-term solar variability are the solar minima, as shown in Figure 7. Best described by accounts of the Maunder minimum from ~1645 to 1715, rapid, drastic changes in climate can occur. One expects the effects to vary drastically from one geographical region to another, beneficial to some societies, but also a terrible blow for other societies. Possibly the effects will be most noticeable for geographical regions at a "climatic borderline" that can "tip" easily one way or another.

A third unpredictable component are short-term variations in galactic rays that aren't accounted for by solar variability. But I don't have a data series for that. Nor will I get into the apparent "changes in phase or state" of the sun that might occur, judging by the behaviour of the sun itself and other stars. We really don't know very much!

It is this great un-predictability of the sun that I call it's treason - while the sun and planets helped to draw mankind into the rational frame of mind and matha & science, this un-predictability seemingly flew in the face of rational analysis. However, it may only appear to be treason. Like a mother bird pushing its fledgling to the next stage in life, this type of chaotic behaviour (together with quantum mechanics and many other areas of mathematics and science) is now drawing our science to another philosophical level - beyond the classical sciences. So it only seems like treason until some day we are better equipped and educated to once again learn by the sun's lead.

The prominence of sun gods in early civilizations suggests that the ancients were well-aware of the major long-term solar changes, and the vicious disruptions that could result from unpredictable solar variability. With the advent of reliable long-term food storage, irrigation systems, and other technological and political advances, perhaps populations became less and less exposed to "normal" solar variability, and their increasing understanding of the world led them to perhaps reject their ancient gods, including the sun-gods. This I call this "the treason of man".

4. The Real Butterfly Effect - on Earth as it is in Heaven

Figure 8 shows two views of combining the predictable Milankovic effects with the unpredictable sunspot effects, taking into account ONLY solar insolation for a given latitude on Earth. It is clear from the results that regional insolar insolation is dominated by Milankovic effects. On the other hand (refer to Figure 2 again), it is also clear that Milankovic cycles are not the whole story. Here is where galactic rays come in. As a "highly leveraged" driver affecting cloud cover and perhaps other processes, one might expect that the "unpredictable" sunspot driver would have a relatively larger effect on climate than insolation alone would suggest. Furthermore, galactic rays can themselves vary independently of solar activity, and these movements may not appear in the data shown.

When looking at a large-scale time-line of history (Figure 9, but see my website for a much larger and more clear updated version), I am reminded of the solar insolation effects in two ways:

1. **Mega-Life and Mega-Death events**, here mostly indicated as the rise and fall of civilizations, seemingly occur with greater frequency during solar minima, and perhaps solar "maxima". (Lesser shocks (positive and negative) of many types, including pandemics, droughts, floods, locust swarms seems to correlate somewhat (but not entirely) with the ~11 year sunspot cycles, as we'll see in the next section. I haven't yet worked on architecture, the arts, science etc. but expect to see some of the same loose, apparent connections (again, the sun isn't a primary driver!).

Solar minima seem to typically last a couple of hundred years, but the recent Little Ice Age appears to have occurred over something like 800 years, with a couple of "scorchers" to break the routine. Solar maxima ("scorchers") seem more often to last only a few decades. However, with the chaotic behaviour during the Holocene, any kind of simple description or classification approach is suspect, other than tools like Charbonneau et al's chaotic "simulation" that reproduces the characteristics of solar activity. Most of us weren't educated in the formal analysis of dynamic systems, let alone chaotic systems, so our descriptions likely fall far short of the mark.

2. **Civilisation/society dominance and leadership** among early agricultural-based civilisations, seems to drift with the predictable, Milankovic component of solar insolation, either by latitude, altitude, or other geographical features that determine regions of agricultural and forestry fertility. Not too hot nor humid, not too cold nor dry. This is reminiscent of the sunspot butterfly diagram, but of course this applies to the predictable Milankovic changes over the Holocene period (as opposed to the unpredictable sunspot behaviour). Of course, the unpredictable short term trends and shocks can cause a reversal of the Milankovic trends (as with the Viking die off in Greenland).

What is really needed here is a geographical model for solar-climate variability. General Circulation Models (GCMs) as used in climate change studies, may ultimately provide a framework, but these models are currently unreliable and misleading for anything except the extremely short time-frame of less than a few weeks. A better approach would be to stick with regional models tied into global drivers (astronomy, geology) and geological/ historical data.

What are some examples of this? The current transition from the Little Ice Age to the Modern Warm Period should be the most accurate and plentiful source of examples, but perhaps it is too convoluted with industrial and technological changes, and our own belief systems may prevent us from properly judging the results.

The Medieval Warm Period - Little Ice Age transition may be the safest source of examples. Easter Island, the Vikings in Greenland (and their overall dominance)

As the theory of galactic rays and cloud cover is relatively recent (since the mid-1900's?, but really being developed since the early 1990's), and as it seems to best account for climate changes (in combination with other drivers), one can expect further significant developments related to the effects of galactic rays on civilisation, either through climate change or other direct (eg cancer) or indirect pathways.

These points are the central theme of our concept, and we can't help thinking that we are missing other

major themes.

5. Pandemics - The cleansing of our sins, the promise of the future

This whole paper is really based on extending the Tapping, Mathias, and Surkan (TMS) theory of solar influence over global influenza pandemics since 1700 (ref). That theory shows an association between the incidence of pandemics and a certain phase of the solar cycle, as illustrated in Figures 10 through 12. Figure 10 shows that, as one would expect, pandemics occur irrespective of the phase of solar activity. However, the solar signature is surprisingly high. Why would the risks of a world wide pandemic be over twice as high in one phase of solar activity compared to lower-risk periods? Other datasets (unpublished, but with not quite as high a confidence level) may indicate an even higher risk.

Moreover, dynamic and solar-pandemic phase analysis has not even been tried, and this appears to be a key question posed by Figure 11. Why are some solar cycles skipped? Is this just a random thing, is it dependent on the solar-climate phasing, or is it dependent on other dynamics?

The "skipped cycles" issue is especially interesting right now, as Figure 12 shows that the last two solar cycles were "skipped by influenza", so:

- has modern medicine and technology conquered the pandemics, or
- is the ~2010 peak period going to go badly, or
- is the oncoming solar cycle, expected to be the second highest in at least 120 years and perhaps in 8,000 years, going to effectively prevent any pandemic from occurring?

We'll find out soon enough, but my assumption is that the strong reactions that we've seen in recent years to stamp out potential sources of pandemics, together with the high temperatures of the solar-driven Modern Warm Period, do not favor a pandemic anyways.

Whether the sun-pandemic correlation is causative isn't really known yet, and it is still possible that the apparent relationship is a chance occurrence, although it is significant in a statistical sense. So the discussions above should not be taken as meaning that a causal link has been established.

If one does assume that the relationship is causative, then why? The most obvious potential link could be the indirect role of the sun as a primary driver of climate changes, and the disease-climate linkage is a very intensive area of research and a key activity of climate science. That may provide much of the basic information needed, albeit for a theme in direct contradiction to the CO2 based thinking upon which the research is justified. However, another sun-pandemic link could be the solar magnetic field modulated variations in high energy (galactic) and lower energy (solar) radiation/particles. ?Aussie physicist? seems to have established a link between UV and non-melanoma skin cancers. Another TMS concept is the possible effect on the immune system, and "evolutionary epidemiology". Of course, it is inappropriate to jump to too many hard conclusions on mere associations, but it is even worse to totally ignore data, especially when alternative theories are less well based.

Other diseases have been looked at in a very preliminary fashion, without statistical analysis (see Howell "Ring around the rosies"). There are strong "visual indications" on the basis of extremely limited data that malaria, the bubonic plague, and cholera have a "solar signature", but not so much smallpox (although perhaps due to a lack of data). Measles and a couple of other diseases were recommended subjects of study, but nothing has been done for them.

As far as cancers are concerned, preliminary searches didn't find anything beyond the Australian solar UV - non-melanoma link, but others may have already worked in this area. One interesting parallel is the concern over air crew exposure to circum-polar flights, especially during periods of peak solar activity (coronal mass ejections etc). Apparently, Lufthansa may have even implemented precautionary grounding of pregnant stewardesses even though there may not be convincing data of significant effects on the crews.

But while we're on the subject of pandemics, Figure 13 is a very interesting illustration of the use of "virtual plagues" for evolutionary computation approaches to the solution of complex scientific and engineering problems that are "too difficult" for classical methods. The virtual plagues wipe out most of the population (we'll call these "solution agents" for simplicity, even though they're not "agents in the normal computational sense). The improve effectiveness of populations for finding solutions can be significant, and it makes one think if human disasters naturally accomplish the same thing! (At least there is some good that comes from the depths of despair?)

There is much more to "Mega Life" and "Mega Death" than just pandemics as discussed in this section, but preliminary work has not been pulled together for locust swarms, crop diseases, floods, droughts, and natural factors that drive huge increases in agricultural productivity. And major campaigns of conquest are also of interest. These are for ongoing research.

6. The Prophecies of the Sun

(Not enough time to cover this in my presentation)

So what awaits us in the future, for our lives, the lives of our children and grandchildren, and for a million years to come? All of the comments below assume that the solar behaviour will resemble the "recent past", but there is certainly no guarantee of that!!

Short term weather forecast to 2100 - Solar physicists Absudamov and Hathaway have commented on the possibility of a major solar minimum starting somewhere in the 2020 to 2050 time-frame, but keep in mind that these scientists are acutely aware that any forecast of solar activity beyond the next Hale half-cycle is very iffy. Eventually, there will be another solar minimum, but exactly when and how severe is another question. Some feel that the 8,000 year high in solar activity over the last 50 years may give rise to a particularly severe and prolonged minimum. An interesting question is whether our advanced society is robust enough or insulated enough from climate shocks to weather the solar minimum comfortably. The example of the solar signal in influenza pandemics is disquieting, but we'll have to wait and see!

Ultimately, the work of Dikpatie et al at NCAR in Boulder Colorado, and especially of Paul Charbonneau and team at the University of Montreal, is the type of effort that is critically important to developing an understanding of the sun and its effect on civilisations, climate etc etc.

Mid-Term forecast (10ky) - Some researchers (eg Ruddiman) have commented that the descent into the next ice age should occur right about now, while at least one other (?name?) has suggested that the next won't occur for another 650,000 years! By looking at the bottom part of Figure 4, it seems that temperatures tend to "crash up" at the end of a glaciation period, and "dipsey-doodle down" as the

Earth slips into an ice age. Perhaps this is due to the combination of temperature stabilization by extensive glaciation dissipating rapidly as the major temperate regions "break free", somewhat as happens every spring when temperatures skyrocket as the last of the "main" snow cover melts away. By looking at Figure 4, your guess about the onset of the next glaciation may be as good as the specialists. At the very least, one should never shy away from working with the data and analysis with whatever tools one can muster - it gives you a more critical vantage point for judging scientific work, and you will probably learn something and have fun at the same time.

Long term forecast (to 1My)- Astronomical factors that will affect our climate and perhaps other systems include:

- predictable Milankovic (incl lunar), galactic & other "cycles"
- chaotic astronomical variability (solar, Milankovic, galactic), interaction with the stars
- random events - meteorite impacts over the next 1 My
- the unknown - what really is going on under our feet? (geothermal and geo-magnetic)

However, over timescales of a million years, one really has to be worried about the changes that have occurred in the last 2 to 8 My, and whether whatever mechanisms involved will induce quite different results in the future.

Hybrid-man and Hyper-complexity

Hybrid human-machine intelligence and advance machine intelligence, together with improved understanding of Computational intelligence themes such as evolutionary theory, neural networks, fuzzy systems, particle swarms, chaotic systems, quantum computing etc etc and whatever new major concepts arise, all of these promise that societal complexity will go far, far beyond Tainter's imagination. What then, are the next conceptual roadblocks or constraints to civilisations? One can rest assured that any such system will quickly evolve to its limitations, and onto the next generation of abstract advances.

7. Conclusion

Although work is very preliminary and incomplete, initial results provide encouragement for the concept that short-term unpredictable astronomical un-predictability has caused shocks every several hundred years that are sufficiently severe to be involved in the collapse of some civilisations, while helping to spark new civilisations or the spread of existing civilisations.

Longer-term predictable Milankovic "cycles" (plus other astronomical/ geological "cycles" and their effects on galactic rays) provide what may be a strong overall influence on which areas of the Earth have civilisations that flourish and decline. We're still not at the stage where we can make the entire Sahara desert the African equivalent of the American mid-west, or the South-east Asian farms, so natural trends and variability may continue to be major determinants of the fate of civilisations over the mid-term.

These themes are intended to compliment existing theories for the development of civilisations, and as such they will only provide a part of the story. It will be interesting to see how important a shock like a

major solar minimum or maximum will affect advanced societies that have been stabilised by advanced technologies, politics, management and very strong global trade. One would expect our societies to be considerably more robust than those of the past, but it would not be surprising to see a considerable "solar signature" on events of the time. Perhaps we will see the results of such a test in our lifetimes.

Perhaps as we master the new sciences of complexity, in part pulled by our need to understand our sun, our respect for its role in our lives will grow and we will come back on our recent "treason against the sun" - perhaps not to the point of the religions and sacrifices of the ancient civilisations, but perhaps to a revived appreciation of the role of astronomy, and a slightly diminished role for modern gods, although it's more likely that future gods will respond to more abstract and advanced human questions and challenges.

But at the least, perhaps solar physicists will no longer be among the most politically-incorrect of scientists. From the battle cry in the film "300", about the 300 Spartans:

Solar Physicists - Prepare For Glory!

(Of course, the 300 Spartans all died... Paths to glory -> conquest, martyrdom, and Hollywood. Most sincerely via post-humous recognition by future generations.)

Appendix 1 - References

(Tapping, Chabonneau, Laskar, Solanki, Hathaway, Absudamov, Baliunus, Thomson, Boteler, ... Don't blame them for the content of this note - they think we're nuts!!!)

Donna Rae Howell MA thesis ?Mayan civilisation or something?

Bill Howell - Mega Life, Mega Death Toastmasters presentation

Monty Python, producer "The Life of Brian"

Appendix 2 - Climate Change: A current view

Phanerozoic (~570 My) - The really BIG swings in temperature occur in quasi-cycles of somewhere on the order of 70 to 140 million years (My). The best (?only?) theory for this is that the interaction of galactic rays and the helio- & geo- magnetic fields drives cloud cover variability, which has a huge influence on Earth temperatures (Shaviv and Veizer ???). Galactic ray exposure varies by events, but in a general sense because the solar system bobs above and below the plane of the Milky Way galaxy (that's ours) with a period of roughly ?70? My, and passes through the spirals of the galaxy roughly every 140 My. These changes in the relative position of our solar system within the galaxy change our relative exposure to galactic rays.

Intermediate 5 to 20 My - nothing to put here right now

Last 1 My - The dominant theory for recent glaciations is the role of Milankovic cycles - that is, the variation of solar insolation (the amount of solar power that reaches different latitudes) according to the eccentricity of the Earth's orbit, and the tilt and recession of the Earth's axis (other components are not yet covered in the data that we are using, although it should be noted that the moon's influence is, I believe, included). Refer to Wikipedia for an excellent description of the limitations and problems with the theory Milankovic theory of climate forcing.

Holocene period (last 11 to 15 ky) - Milankovic as the #1 influence, but gradual,

Available data and coherent analysis do not support the scientific fashion- cum cult- cum religion that CO2 is an important driver of climate change, although

Crazy Notes:

(None of this will be covered in the talk)

1. **Lack of modern awareness of the relative importance astronomical/ geological/ evolutionary biology drivers** may be due to a number of factors (this part of a theme that is being worked on gradually by the author - but with no immediate priority):
 - (a) Technology and global trade has insulated us from all but the most extreme short to mid-term trends and events. While long-term trends are obvious, they seem to be outside our attention range (event scientifically). For example, peoples' eyes immediately glass over when you start to talk about a 100 year climate forecast, let alone 1 My!
 - (b) Blowing in the wind - A favorite and counter-intuitive theme of mine is that, apart from extremely rare people, logic and rational is not a dominant mode of thinking homo sapiens isn't very good a. Unfortunately I am not one of those rare people <grin>, and it is about as rare for scientists as any other group in society.
 - (c) Modern education, research careers, and wonderful opportunities for individuals to have the time and resources to tackle challenges, do not seem to be able to change this from a rarity to a general skill for significant portions of the population (including me).

2. **Relative changes in complexity are a result and measure of collapse, but they are not a driver**, although complexity may be a more direct long-term driver for growth (as an "enabler", but even here I suspect that it is more of a measure). I am not at all convinced by arguments and examples that I've seen that there are many, if any, historical examples of collapse driven by excessive complexity. I suspect that there is always a "to and fro" of relative complexity, and that when conditions are right excessive complexity may contribute to or even trigger a major collapse, but it would rarely be a basic cause or driver. Not having even read Tainter's book, these are dangerous and reckless statements, so this should just be considered to be an impression without conviction. It is also the result of my natural tendency of playing devil's advocate: people must be given respect, but ideas must be torture, mutilated, dismembered, bent, blended and separated. Unfortunately, a major problem arises when people self-identify with their ideas, or when such appropriate treatment of ideas is extend to how people are treated.

3. **Robustness of organisations, societies and civilisations.** (see point 1 as well) It seems to me that a far more important driver of collapse would be the one-two punch of new internal or external environmental changes (including business, trade etc) combined with an inability of a group to reject conventional or politically correct thinking
 - (a) Most people are believers, there are very, very few critical thinkers. Most scientists are like most people. (They are, after all, people!)
 - (b) Blowing in the wind - Real changeovers in beliefs seem to occur when people sense subtle changes in the speed and direction of the prevailing "politically correct scientific fashion/ cult/ or religion". Once aligned in the new direction, there is no better basis for their beliefs than in the past, right or wrong.
 - (c) Cheats, Parasites and Fools - see my website (we're all stupid - it's a complex world out there)

4. **Astronomy, geology, and evolutionary biology are primary drivers of climate.** It is my

belief that anthropogenic greenhouse gases (eg CO2 emissions etc) will prove to be at most a minor contributor, but more like are an insignificant contributor. However, politically-correct but false belief systems may persist for thousands of years, and the vast majority of modern scientists are no different than the ancient priests in this adherence to beliefs (this includes the present author).

We don't normally think in terms of the biological / mental evolution of homo sapiens (via Mendelian hereditary mechanisms or even perhaps via Lamarckian heredity). I suspect, however, that our politically-correct, highly emotional stand that all humans are the same and we have been for some time is just flat wrong. In spite of our relatively benign modern economies and freedoms, I suspect that we are evolving very quickly - for now diversification is perhaps the runaway theme, but only modest advances in cognitive function could have a huge impact on society.

5. **Earthquakes and volcanoes** - It sounds crazy, but could it be that solar activity (or more general astronomical activity) also influences major geophysical catastrophes? This is very speculative at the present time, but "low-level" seismic activity has been linked to solar activity by one scientist, and with many other climate-related questions we have persistently misjudged the importance and relevance of seemingly negligible changes.
6. **BGI datum, a politically-correct dating basis** - It is clear that the use of "years BC or AD" are racist and exclusive of much of the world's population. Unfortunately, simply changing the term to BCE and CE (Common Era) is just as racist because it is clearly still based on the date of Christ's birth. In order to avoid this racist basis and thereby to treat other peoples with respect, we propose dating from an arbitrary year in the early part of the Holocene period, somewhat before solar insolation bottomed and levelled off. The chosen date is equivalent to 11,000 BC, and is called the year BGI, for "Before Gods were Invented". That should keep us out of trouble....

Note: Without clear written records, whether true gods existed or not before BGI will be difficult to prove and isn't much of a concern to us anyways. Politically correct thinking doesn't have to be chained by reality, data, or coherent analysis, so neither should we on this point. Moreover, we have adopted this framework of thinking from standard practice in environmentalism, health remedies, and Hollywood, and everybody loves them.

7. **Jared Diamond's themes from "Guns, Germs, and Steel" and "Collapse"** - While I see these themes as being useful, to me the applicability
8. **Joseph Tainter's Complexity theories** - I've provided comments in the main text. I like the idea, but it has not been developed sufficiently, nor have the tools and measures been developed to make it applicable for full-fledged states (tools such as evolutionary theory, complexity theory, dynamic and asymmetric economics, or perhaps more importantly cognitive economics, information theory, etc etc). His complexity is limited to the transitions between tribes, big Chiefs, ???, states, and the concept must be extended far beyond that crude distinction.
9. **Arnold J. Toynbee's theme of "successful challenge and response"**, mixed with a better

description of how and why we develop dysfunctional and/or dishonest and/or delinquent belief systems, and how to destroy these, sees to me to be the best avenue of pursuit to combine with the astronomy/geology/evolutionary biology and climate theme. Toynbee's major "Study of History" seems to include detailed descriptions of the environmental themes, in a very balanced way.

10. **Cleansing of our sins** - Even in modern times many believe that catastrophes befall societies that have fallen into sin or which fail to adhere to the appropriate behavioural norms. Maybe this is right, and maybe its backwards, in the sense that modern computer science has shown the effectiveness of "plagues" as a tool to improve the solutions for some complex problems (Figure ??).
11. **The Life of Brian** - We were taught about history partially through the eyes of this film, and I agree that there is more to what Brian says than he realizes. I just don't know what it means.

Mega Life, Mega Death, and the invisible hand of the Sun:

Towards a quasi-predictive model for the rise and fall of civilisations

Neil & Bill Howell
04Apr07

Figure 1: Predictible, smooth, long-term Galactic cycles
Reference: Shaviv & Veizer

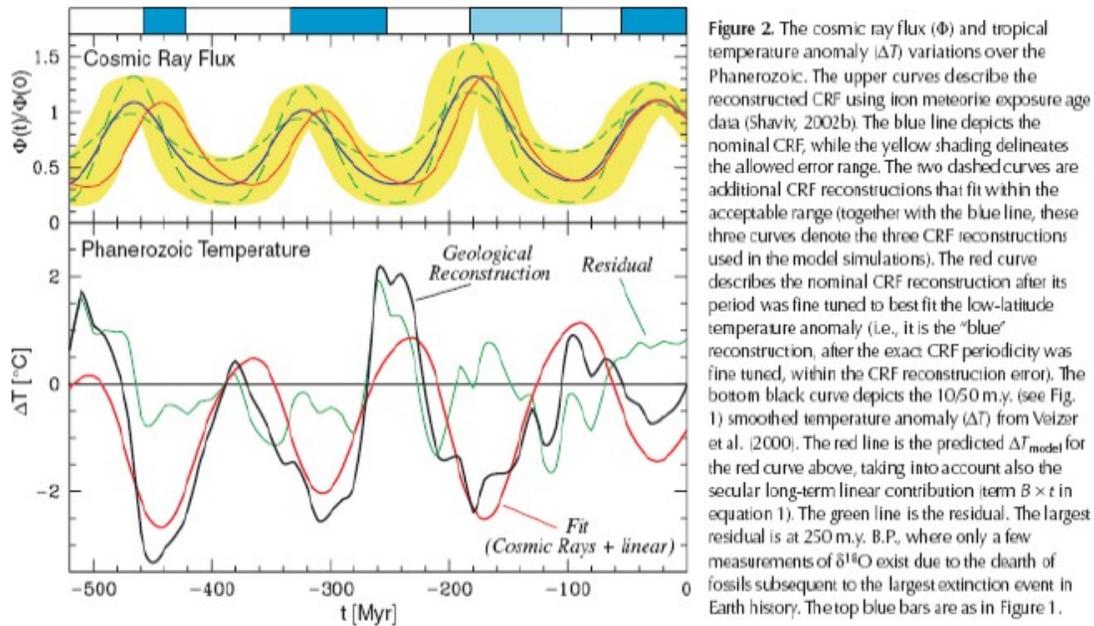
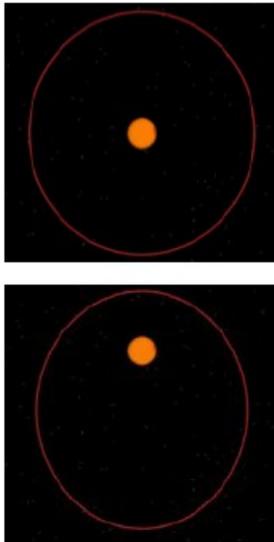


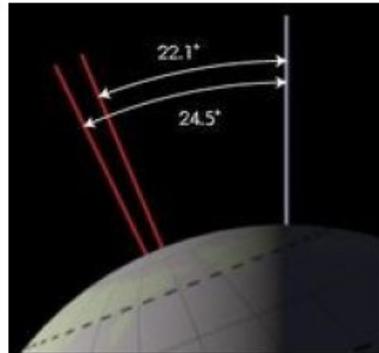
Figure 2: Predictable, smooth, mid-term Milankovic cycles

Reference: www.Wikipedia.com encyclopedia,

Orbit Eccentricity
(~100 ky)



Earth Axis Tilt
(~40 ky)



Earth axis precession
(~20 ky)



Figure 3: Predictable, smooth, mid-term Milankovic cycles

Reference: Wikipedia encyclopedia,

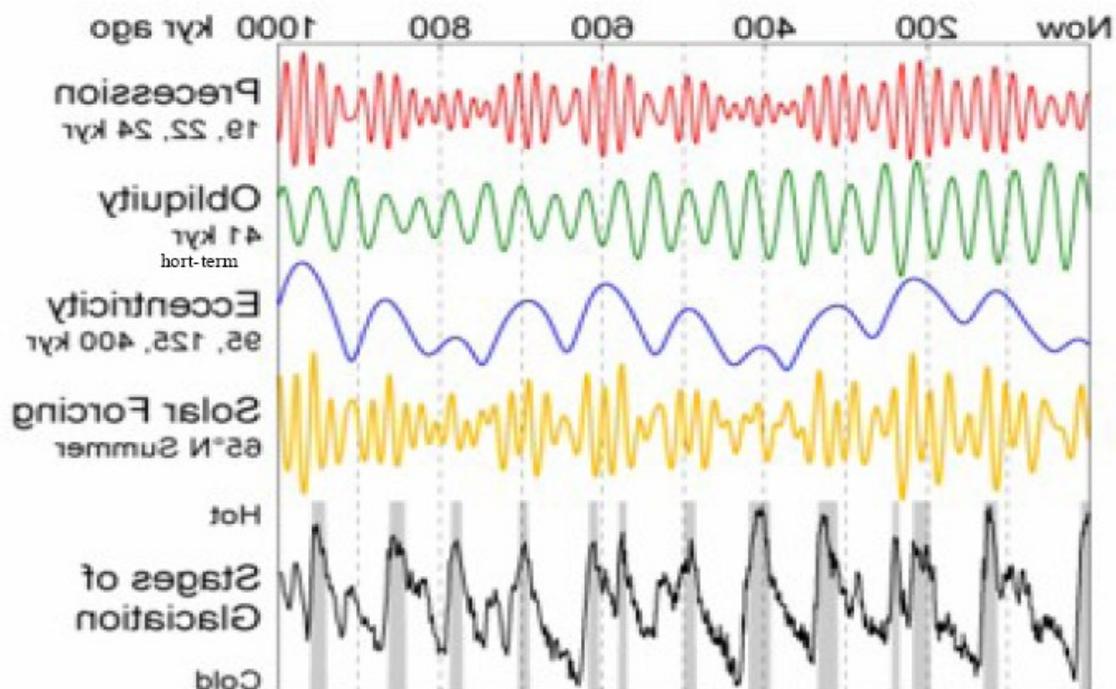


Figure 4: The predictable side of a Sunny future
Reference: Laskar etal www.Wikipedia.com www.BillHowell.ca Figures shown for latitude 65 N

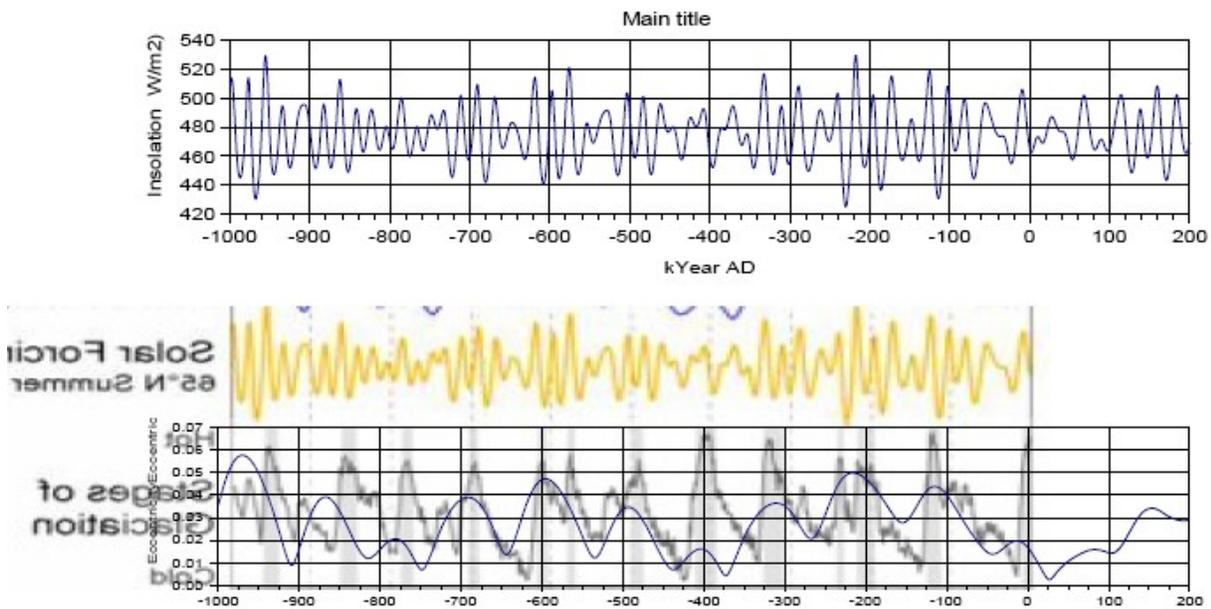


Figure 5: Holocene period - regional insolation by season
Reference: Laskar etal www.BillHowell.ca

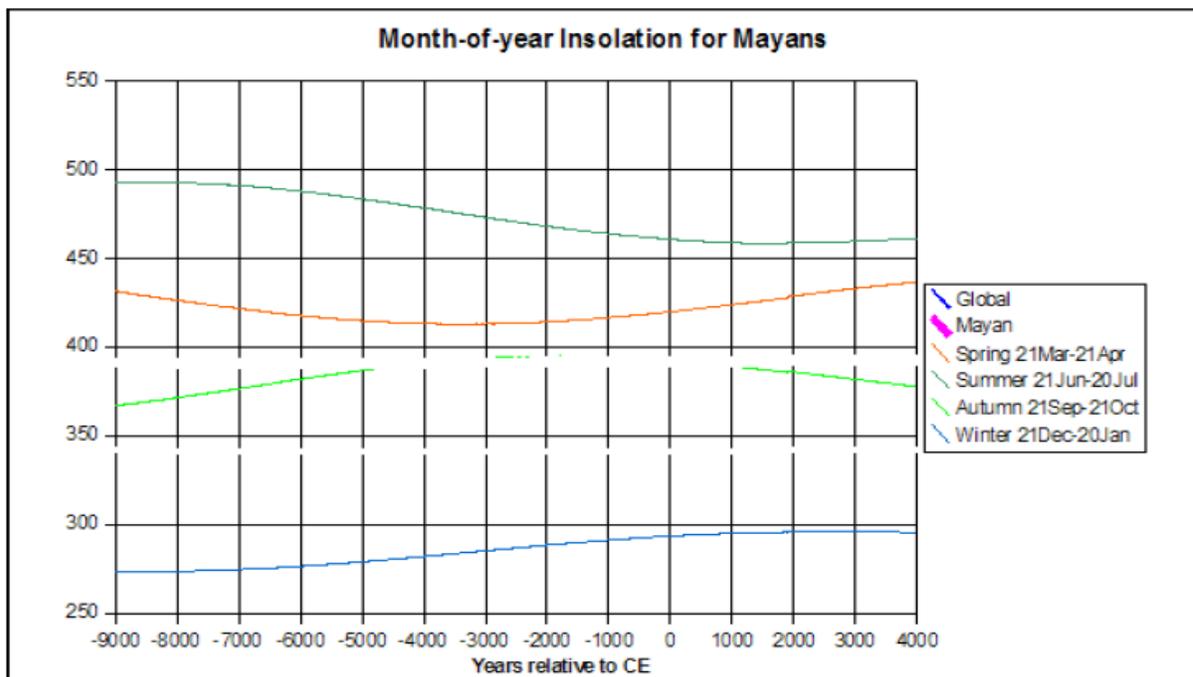


Figure 6: Un-Predictible, erratic, short-term solar cycles

Reference: Wikipedia encyclopedia,

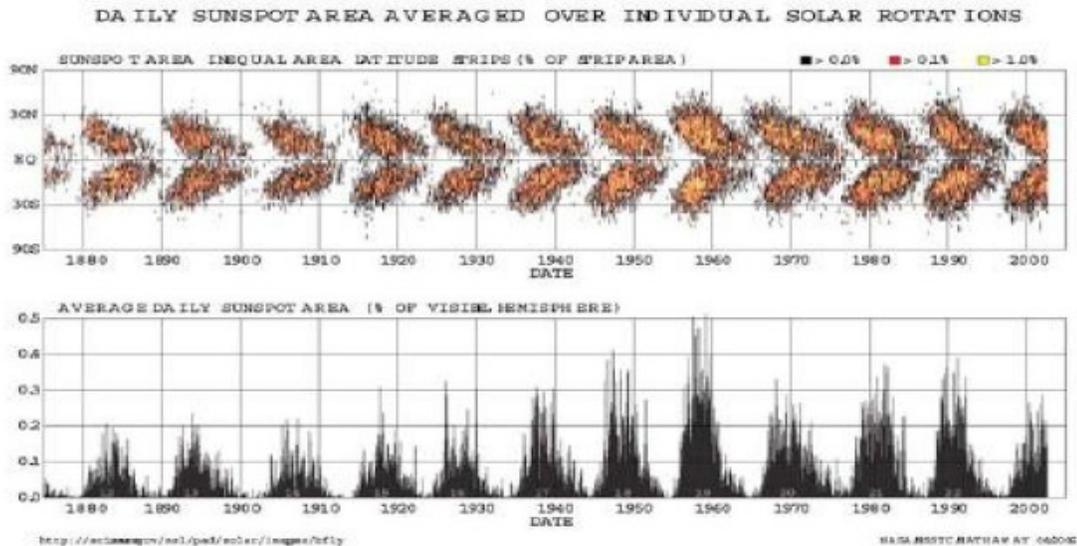


Fig. 2.1. Butterfly diagram (upper panel) and record of relative solar surface area covered by sunspots (lower panel). Upper panel: the vertical axis indicates solar latitude, the horizontal axis time. If a sunspot or a group of sunspots is present within a certain latitude band and a given time interval, then this portion of the diagram is shaded, with the colour of the shading indicating the area covered by the sunspots. (Figure courtesy of D. Hathaway, <http://science.nasa.gov/ssl/pad/solar/sunspots.htm>).

Figure 7: Un-predictible, erratic, short-term solar minima

Reference: Ken Tapping et al 2007?

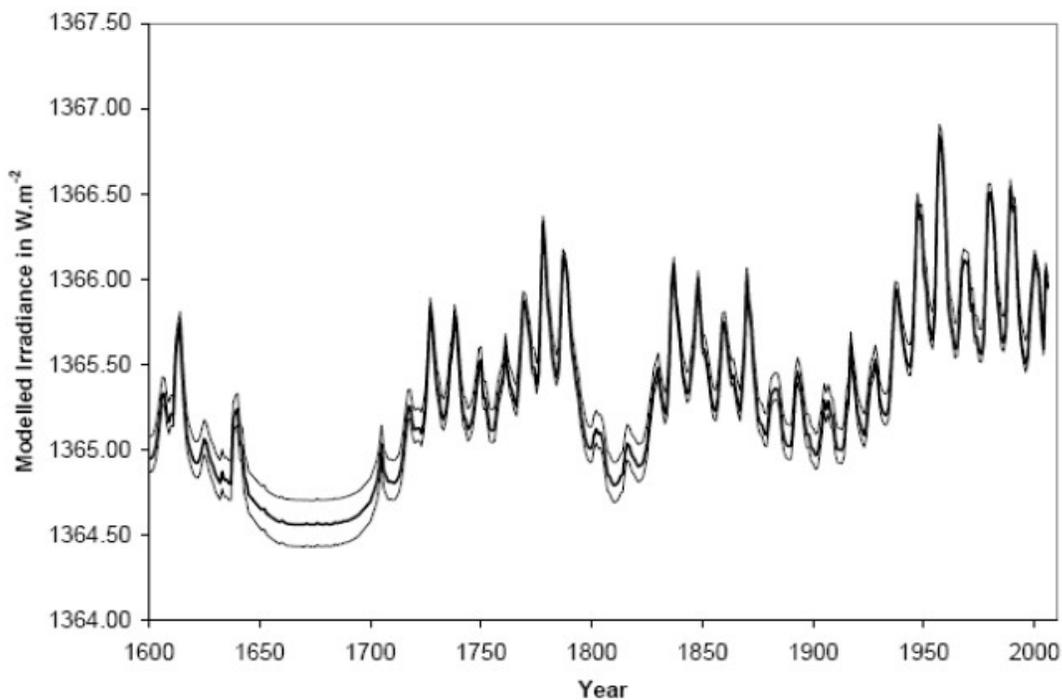


Figure 8: Holocene period - global and regional insolation

Reference: Laskar etal www.BillHowell.ca

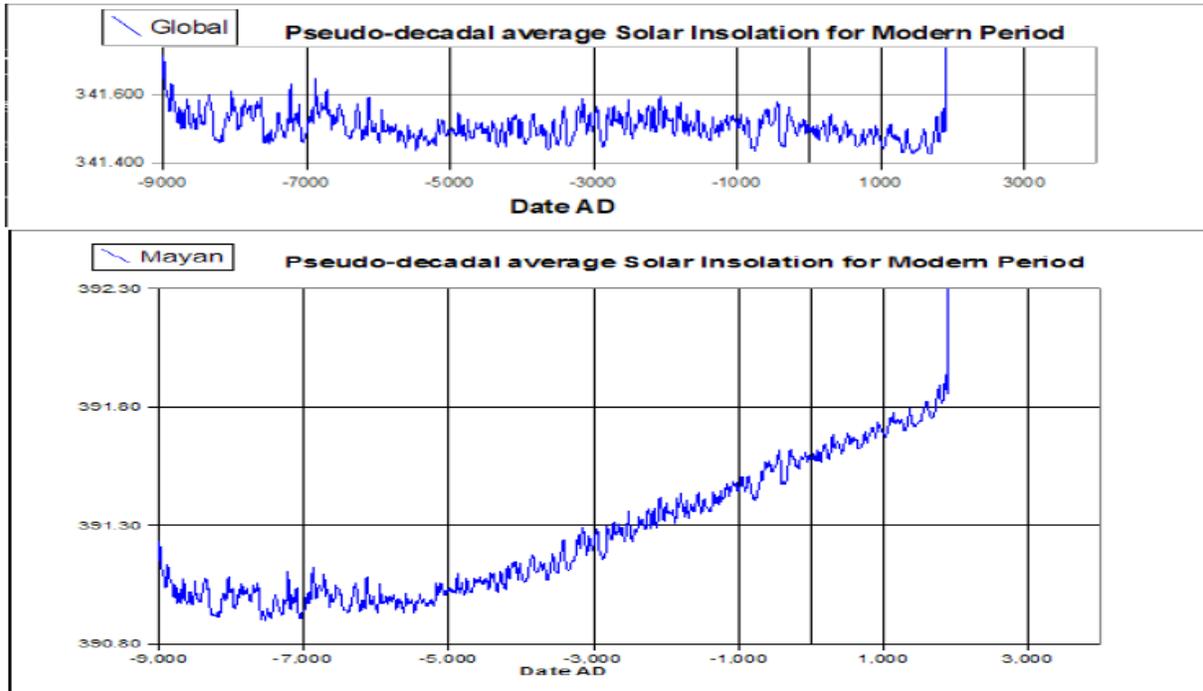
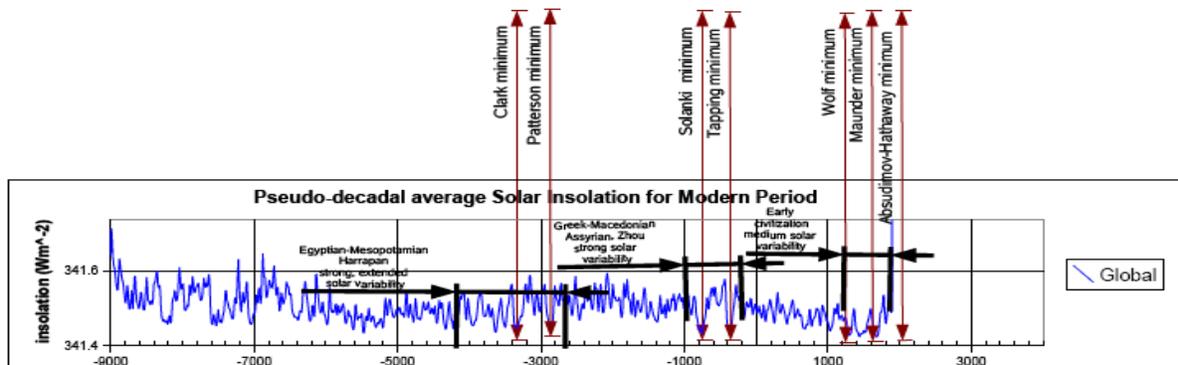


Figure 9: Holocene period - solar shocks
(Note: refer to the much larger chart on my website!)

Reference: Laskar etal, Solanki etal, Tapping etal, www.BillHowell.ca



Historical Kingdoms, Ages, periods are not coherent nor well-defined.
Even within small geographical areas there can be high diversity and divergence of fates.
However, archaeologists/ historieans have found it useful to describe periods.
If nothing else, it helps communication.

Figure 10: Influenza pandemics & solar phase

K.F. Tapping, R.G. Mathias, D.L. Surkan, Canadian J. Infectious Diseases, vol 12, no 1, pp 61-62, Jan-Feb 2001

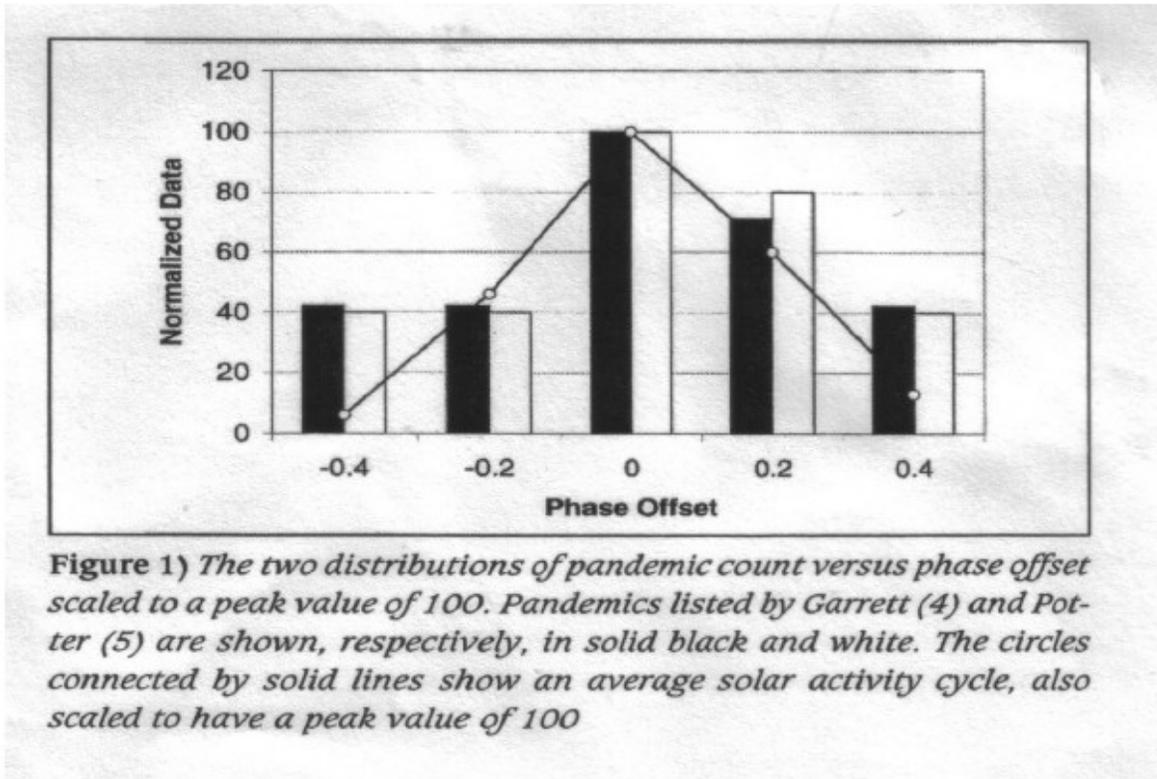


Figure 11: Influenza pandemics and solar activity

K.F. Tapping, R.G. Mathias, D.L. Surkan "Pandemics and Solar Activity - Elaborated" Unpublished as of 09Mar06

Unpublished - not for distribution

Figure 12: Recent Influenza Pandemics

K.F. Tapping, R.G. Mathias, D.L. Surkan "Pandemics and Solar Activity - Elaborated" Unpublished as of 09Mar06

Unpublished - not for distribution

Figure 13: OPTIMAL ELECTRICAL DISTRIBUTION NETWORK DESIGN USING GENETIC ALGORITHMS

Reference: ?Turkish conference?

Unpublished - not for distribution

Conclusion

Solar Physicists
Prepare for Glory!

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